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Large Hadron Collider
Magnet Division Procedure

Proc. No.: LHC-MAG-R-1053

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Title: LHC D2 & D4 IFS Installation

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REVISION RECORD

Rev. No.	Date	Page	Subject	Approval
A	5/24/02		Initial Release	
B	8/15/02		Changes per ECN #MG2105	

1 Scope:

This procedure describes the steps to install D2 & D4 IFS feedthrough assemblies into cryostatted magnets.

2 Applicable Documents:

14060003	IFS Assembly, D4
14060004	IFS Assembly, D2
LHC-MAG-R-1051	Electrical Testing of Level & Temperature Sensors
RHIC-MAG-Q-1004	Discrepancy Reporting Procedure

3 Requirements:

3.1 Material/Equipment:

None

3.2 Safety Precautions:

3.2.1 All lifting of the cryostatted magnet shall to conform to Appendix A.

3.2.2 No welding shall take place unless all welding screens are in place around the welding station, and all personnel not directly involved with the welding process are outside the screens. Any personnel inside the screens shall wear protective gear to prevent eye injury, and shall be clothed to prevent burns caused by intense ultra-violet light.

3.2.3 Operators shall be trained by their cognizant technical supervisor and qualified in the operation of the required welding equipment.

3.2.4 All lifting and handling operations requiring overhead crane operations shall be performed by holders of valid Safety Awareness Certificates. Operators shall also be briefed in the use of the appropriate lifting device by the Cognizant Engineer or Technical Supervisor.

4 Procedure

4.1 Mechanical Preparations

4.1.1 Weld the extension ring to the feedthrough.

4.1.2 Leak check the weld of the extension ring. Leak rate not to exceed 2 x 10^{-10} Std cc He /Sec.

4.1.3 Temporarily mount the feedthrough to the magnet cryostat using the mounting bracket. Be sure the feedthrough will be oriented properly based on the dash number of the magnet.

4.2 Electrical Connections

4.2.1 Install NOMEX wire guard discs onto top of cryostat port. Strip the insulation from the end of each of the cables in the harness so that the individual insulated wires will reach the pins on the feedthrough.

4.2.2 For each wire, slip the two pieces of shrink sleeve over the wire, strip the insulation from the end of the wire, slip the conductor into the proper pin and solder in place.

4.2.3 Position the inner piece of shrink tube as shown on the assembly drawing and shrink it with a heat gun.

4.2.4 Position the outer piece of shrink tube as shown on the assembly drawing and shrink it with a heat gun.

4.2.5 When all the wire connections have been made, neatly coil and bundle the wires so that the feedthrough can be lowered into place.

4.2.6 Wrap the Nomex guard around the wires. Interlock the two slots to form a ring and secure with Kapton tape.

4.3 Final Installation

4.3.1 Lower the feedthrough into place. Be sure it is positioned properly based on the dash number of the magnet.

4.3.2 Temporarily restrain the feedthrough using 3 small tack welds.

NOTE

The feedthrough must not be permanently welded until the weld of the IFC cup to the cryostat port flange has been leak checked during prep for cold test

4.3.3 Perform electrical checks as noted in Appendix B.

NOTE

The following section is performed <u>after</u> the vacuum vessel is pumped down and leak checked in preparation for cold test. This will verify the vacuum integrity of the weld of the IFS cup to the cryostat port flange.

4.3.4 Use the small tube in the feedthrough to purge the feedthrough with argon and weld the feedthrough in place.

4.3.5 Install and weld the cap on the small purge tube.

4.3.6 Perform electrical checks as noted in Appendix C.

NOTE

Hypot voltages are lower than those used in previous testing due to limitations of the test facility

4.3.7 Install the connector box, PC board, and cover on the feedthrough.

5 <u>Quality Assurance Provisions</u>

5.1 The Quality Assurance provisions of this procedure require that the technician shall be responsible for performing all operations in compliance with the procedural instructions contained herein and the recording of the results on the production traveler.

5.2 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with RHIC- MAG-Q-1004.

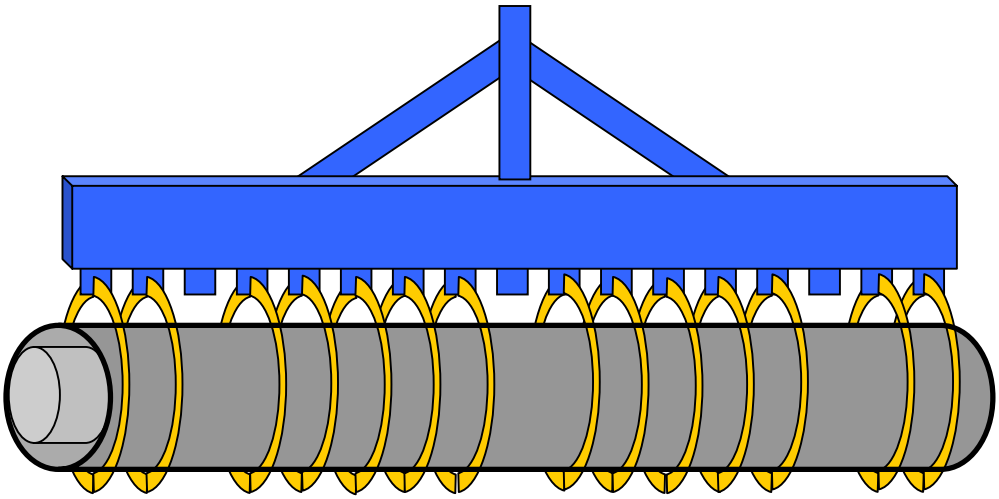
5.3 Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with RHIC-MAG-Q-1000, where applicable.

Appendix A - Lifting Scheme for Cryostatted D2 Magnet

CAUTION

Weight of D2 Magnet Assembly exceeds rating of the Lifting Beam (BNL Dwg. 25-1782.02). Use of this device is permitted to lift the D2 Magnet Assembly only if load is equally distributed on 14 of 17 lifting lugs (center lug and lugs 3 from each end are not used).

Using 14 slings and Lifting Beam 25-1782.02 as shown below to move the magnet assembly.



Magnet Assembly Rigging

Appendix B - Electrical Checks- 1st Checks

1. Connect both beam tubes, all quench protection resistors & iron to each other and to ground. Connect all coils together and perform 5 kV Hypot between coils and ground per RHIC-MAG-R-7242 and RHIC-MAG-R-7243.

NOTE

The leakage current must be less than 50 µa.

2. Connect both beam tubes, all coils & iron to each other and to ground. Perform 5kV Hypot between each of two quench protection resistor circuits and ground per RHIC-MAG-R-7242.

NOTE

The leakage current must be less than 50 µa.

3. Connect both beam tubes, all coils, iron & quench protection resistors to each other and to ground. Perform 2kV Hypot between each warm-up heater circuit and ground per RHIC-MAG-R-7242.

NOTE

The leakage current must be less than 50 µa.

4. Perform DC resistance tests per RHIC-MAG-R-7320 to measure voltage drops across the entire magnet winding and the voltage drop across each individual coil. Perform measurements using regular and redundant voltage taps individually.

5. Perform resistance test between normal and redundant voltage tap wire at each point. Resistance to be 320Ω - 480Ω.

6. Perform resistance test on each of two Quench Protection Resistor circuits.

7. Perform resistance test on each of two Warm-Up heater circuits.

8. Perform resistance check of Level Probes as noted in LHC-MAG-R-1051. Record results in traveler.

9. Perform resistance check of Temperature Sensors as noted in LHC-MAG-R-1051. Record results in traveler.

Appendix C - Electrical Checks - 2nd Checks

1. Connect both beam tubes, all quench protection resistors & iron to each other and to ground. Connect all coils together and perform 500 Volt Hypot between coils and ground per RHIC-MAG-R-7242 and RHIC-MAG-R-7243.

NOTE

The leakage current must be less than 50 µa.

2. Connect both beam tubes, all coils & iron to each other and to ground. Perform 500 Volt Hypot between each of two quench protection resistor circuits and ground per RHIC-MAG-R-7242.

NOTE

The leakage current must be less than 50 µa.

3. Connect both beam tubes, all coils, iron & quench protection resistors to each other and to ground. Perform 500 Volt Hypot between each warm-up heater circuit and ground per RHIC-MAG-R-7242.

NOTE

The leakage current must be less than 50 µa.

4. Perform DC resistance tests per RHIC-MAG-R-7320 to measure voltage drops across the entire magnet winding and the voltage drop across each individual coil. Perform measurements using regular and redundant voltage taps individually.

5. Perform resistance test between normal and redundant voltage tap wire at each point. Resistance to be 320Ω - 480Ω.

6. Perform resistance test on each of two Quench Protection Resistor circuits.

7. Perform resistance test on each of two Warm-Up heater circuits.

8. Perform resistance check of Level Probes as noted in LHC-MAG-R-1051. Record results in traveler.

9. Perform resistance check of Temperature Sensors as noted in LHC-MAG-R-1051. Record results in traveler.